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24th August 2009

Re: D0160-01 – Dunmanway Waste Water Discharge Licence Application – Reply to notice in accordance with Regulation 18(3)(b) of the Waste Water Discharge (Authorisation) Regulation 2007

Dear Ms. O'Connor,

I refer to your letter of the 30th June 2009 concerning the above. Attached is my reply to your request for further information in accordance with Regulation 18(3)(b), the appropriate assessment of the potential effects of the discharge from the Dunmanway waste water treatment plant.

Yours Sincerely,

Niall O'Mahony
A/Director of Services

Cork County Council

Dunmanway Sewerage Scheme Upgrade

Appropriate Assessment

Moira Murrell,
Director of Service,
Kent St.,
Clonakilty

August 2009

Cork County Council
Dunmanway SS Upgrade Appropriate Assessment

Contents

1 Introduction

Dixon.Brosnan environmental consultants carried out an impact assessment in 2004 in respect of an upgraded wastewater treatment plant to be constructed at Dunmanway, Co. Cork. An ecological assessment was requested by the Heritage section of the Department of Environment (Duchas). The Appropriate Assessment the subject of this report is based on the impact assessment carried out by Dixon Brosnan.

The proposed upgrading consists of the construction of a new wastewater treatment plant and associated pumping stations with discharge relocation at River Bandon. While the existing plant is overloaded leading to breaches of effluent standards the proposed plant will comply with Urban Waste Water Regulations resulting in a considerable improvement in effluent quality.

2 Stage One: Screening

2.1 Brief description of the Natura 2000 site

The section of the Bandon River into which the treatment plant discharges is a Special Area of Conservation (SAC 2171). See Site Synopsis at Appendix 1.

The site is important for a number of reasons. It contains a small though very important example of the Annex I priority habitat Alluvial Forest as well as good examples of another Annex I habitat - Floating River Vegetation. The Annex II animal species Otter, Salmon (*Salmo salar*), Brook Lamprey (*Lampetra planeri*) and Freshwater Pearl Mussel (*Margaritifera margaritifera*) occur. The populations of the Mussel are thought to be nationally important. The Kingfisher, listed under Annex I of the E.U. Birds Directive, breeds along the river.

2.2 Assessment Criteria

The current discharge of sewage would be expected to cause deteriorations in water quality. In the absence of an appropriate upgrade the increase in population in Dunmanway will lead to greater discharge of nutrients to the Bandon River.

Due to the increasing load on the plant and the need to provide a satisfactory effluent quality, it is proposed to upgrade the treatment plant to cater for the existing and future increased loads.

2.3 Describe any likely direct, indirect or secondary impacts of the project on the Natura 2000 site

Based on the available results it would appear that the existing discharge is having a negative impact on river water quality.

It is proposed to design the extended and upgraded wastewater treatment to cater for a population equivalent of 3,500 PE. The effluent from the upgraded plant will be to Urban Waste Water Directive standards as follows:

BOD	25	mg/l
COD	125	mg/l
Suspended Solids	35	mg/l
Total Phosphorus	1.5	mg/l

This will lead to an improvement in effluent quality and will significantly reduce the amount of biological oxygen demand and nutrients reaching the river despite the increase in population.

It is proposed to relocate the discharge from the upgraded WWTP to a point downstream of the existing location. This will involve excavation work which may affect the terrestrial and riparian habitats.

The existing and proposed Waste Water Treatment Plants are located just outside the Special Area of Conservation while the discharge pipe is within it and discharging to the River Bandon which is also within the SAC.

The duration of the upgrade to the Waste Water Treatment Plant would be of the order of 18 months while simultaneously the relocation of the discharge pipe would be of duration of approximately one month.

2.4 Likely changes to the Site:

2.4.1 Habitat Reduction

No reduction in habitat area is envisaged as the existing and proposed Treatment Plants are located just outside the Site boundary. It is proposed to move the discharge point downstream so that it discharges completely into channel A. The terrestrial and riparian habitats to be affected would not be significantly different to those existing at the discharge point and the exact route could be designed to avoid the more locally important habitats such as individual or groups of trees. By choosing a suitable discharge location the distance from the external hedgerow to the channel can be minimised.

2.4.2 Disturbance to Key Species

2.4.2.1 Impacts on Fish

The Bandon supports important populations of salmonid fish and brook lamprey. These species are susceptible to deteriorations in water quality. Salmonid species breed in clean gravels and therefore breeding success can be affected by increased silt levels.

2.4.2.2 Impacts on invertebrates.

From conservation viewpoint the freshwater pearl mussel is the most important invertebrate species in the Bandon River. This species is susceptible to deteriorations in water quality and is particularly sensitive to large increases in suspended solids. The distribution of other macroinvertebrate species within the watercourse will be altered by changes in water quality however these impacts will be localised in extent.

2.4.2.3 Impacts on aquatic vegetation

Changes in nutrient levels will affect the distribution and density of aquatic plants. High levels may increase growth however the diversity of species may be significantly reduced. In these circumstances water crowfoot may be dominant and where nutrients levels are extremely elevated algae and other fungal growths may be dominant.

2.4.2.4 Noise Impact

Noise impacts could occur during construction and from the everyday operation of the plant. The treatment plant itself is situated in an agricultural landscape where noises associated with farming are common and in this context works at the plant itself are unlikely to significantly impact on noise levels. The outfall laying works will be relatively short in duration and will take approximately 4 weeks to complete. Some impact on mammals and birds would be expected to occur due to noise generated by work on the pipeline. This impact will increase as the works get closer to the river. However given the limited duration of the works and the degree of cover available close to the discharge point this impact is expected to be of local significance only and no long-term impacts are expected. Following construction of the wastewater treatment plant it is recommended that noise levels do not exceed 55db during daylight hours and 45db at night. Under these circumstances no significant impacts are considered likely.

2.4.3 Changes in key indicators of conservation value

The effluent from the upgraded plant will be to Urban Waste Water Directive standards leading to an improvement in effluent quality and significantly reducing the amount of nutrients reaching the river.

2.4.4 Likely impacts on the Natura 2000 site as a whole

The chief risk is to river water quality. However as the upgrade Waste Water Treatment Plant will provide for an improved effluent quality this risk is greatly reduced.

2.5 Indicators of significance as a result of the identification of effects set out above

2.5.1 Habitat Loss

Based on the pattern of invertebrate distribution it would appear that the current discharge is severely impacting on water quality in channel A. This effect is particularly evident close to the discharge point. However notwithstanding the excessive shading and slow-

flows which would naturally depress the diversity and density of macroinvertebrates it would appear that this effect continues for the length of the channel. However the additional flow available in the main channel downstream of the confluence would appear to provide sufficient dilution and no impact on water quality was detected. The proposed effluent quality improvement which will be provided by the upgraded Waste Water Treatment Plant will ameliorate this impact in channel A considerably.

2.5.2 Fragmentation

There will be no habitat fragmentation as a result of the upgraded Waste Water Treatment Plant.

2.5.3 Disruption/Disturbance

There will be minimal disruption or disturbance to the elements of the Site provided the basic precautions mentioned above are carried out.

2.5.4 Changes to key elements of the Site

It is important that damage to the riparian zone is minimised and it is recommended therefore that large machinery is excluded from this area. Hand tools should be used in close proximity (within 10m) of the river. As a general guideline the hedge at the end of the field in which the treatment plant is located should form a boundary beyond which heavy machinery should be excluded.

The new discharge point must be located so as to minimise the risk of erosion of the riverbank. In particular the number of mature trees to be removed should be minimised and positioning of the pipe should give due regard to specific trees which are stabilising the riverbank.

Due to the risks of pollution associated with instream works, a precast concrete structure is preferable where stabilisation of the discharge point is required.

It is important that the land-take area is restricted to the minimum necessary to provide the new discharge pipe. Storage of materials and vehicles should only take place outside of the riparian zone.

Consultation with an ecologist is recommended both in the design of a suitable route and during the construction phase. This route should be carefully marked out and agreed with Duchas prior to commencement of works.

2.6 Elements of the project or plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts are not known

The main impact arising from the project will be an improvement in river water quality which will have a beneficial effect on the flora and fauna of the Site.

The new discharge point must be located so as to minimise the risk of erosion of the riverbank. In particular the number of mature trees to be removed should be minimised and positioning of the pipe should give due regard to specific trees which are stabilising the riverbank.

Due to the risks of pollution associated with instream works, a precast concrete structure is preferable where stabilisation of the discharge point is required.

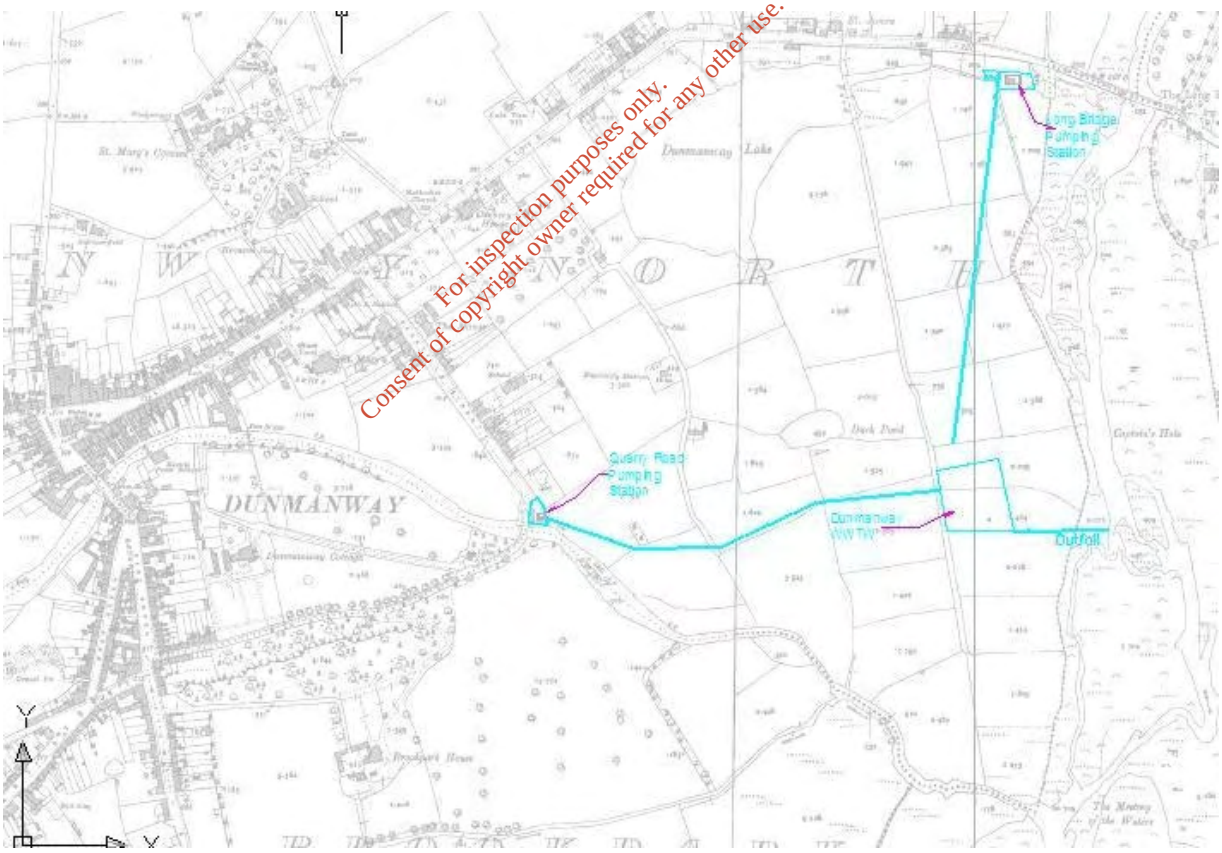
3 Stage Two: Appropriate Assessment

3.1 Step One : Information Required - Full Characteristics of project that may affect the site

The proposed project consists of the upgrade of the Dunmanway Waste Water Treatment Plant and the two associated pumping stations.

3.1.1 EXISTING SEWERAGE SCHEME

Map 1 shows an outline of the current treatment system.



Following flow and load surveys it was determined that the average load to the plant is approximately 2,370 PE at present. The total existing load to the treatment plant based on the population figures and estimates of the loads from non-domestic dischargers is 2,214

PE. This correlates rather well with the loads determined by flow and load surveys. For the purposes of comparison in this report a figure of 2,214 PE will be used.

3.1.1.1 Influent and Effluent Monitoring

The influent and effluent flows of the Dunmanway WWTP were monitored for approximately 5-6 times per year in accordance with the Urban Wastewater Treatment Directives. The results of this monitoring up until the year 2000 are presented below.

Table 1 – Influent Concentrations

Year	COD (mg/l)	BOD (mg/l)	SS (mg/l)
1996	-	142	465
1998	-	-	-
2000	-	-	-

Table 2 – Effluent Concentrations

Year	COD (mg/l)	BOD (mg/l)	SS (mg/l)
1996	-	17	23
1998	27	17	-
2000	206	46	138

The limited amount of influent data restricts the determination of the influent loads. Furthermore, the available data show large differences between the BOD and SS concentrations, which are out of the regular ranges. The effluent data show satisfactory results for 1996 and 1998. The effluent met the discharge standards as set by the UWWTD. In 2000, the effluent concentrations showed a substantial deterioration. The discharge standards were not met in 60-75% of the samples. To determine the treatment levels occurring at present further tests were conduced in May 2004 the results of which are detailed in Table 3:

Table 3: Waste water treatment plant data 2004

	Raw Effluent		Treated effluent	
Date	**BOD (mg/l)**	**SS (mg/l)**	**BOD (mg/l)**	**SS (mg/l)**
13/5/04			33	-
14/5/04			74	177
Composite sample 13-14/5/04	74	228		

Although it is noted that the data is very limited the most recent results suggest that treatment is presently very poor. The results suggest that BOD reduction is minimal and that the levels of suspended solids in the final effluent are elevated. A comparison with results from 2000 suggests that treatment efficiency has deteriorated in the intervening years.

3.1.1.2 Future Population

Cork County Council has drafted a County Development Plan in 2003, in which, among others, the objectives for future development are described. This plan states that Dunmanway is considered to be a key support settlement in the heart of West Cork. The overall strategy aims to improve Dunmanway's important commercial, administrative and institutional functions serving a wide area and to promote its potential as a rural industrial/enterprise location.

The Development Plan has proposed a new development boundary. This has been set to include all the areas that are the subject of specific zoning objectives. In addition, it includes relatively large areas of either established or proposed open space that form part of the structure of the town. For the design of the wastewater treatment plan, a horizon of about 20 years is in general taken as starting point.

3.1.1.3 Future Non-Domestic Loads

In the Development Plan, several zones have been designated for the provision of industries or a post primary school. With common-used design rules for the estimation of the flows and loads (17.4 ha; 28 m^3/ha/day; 0.225 m^3/PE/day), the possible contribution of these zones might allow for more than 2,000 PE. In accordance with the assumptions for the population growth, this might also be considered as the long-term estimate. For the design of the wastewater treatment plant, a figure of 500 PE is assumed to be appropriate. The total non-domestic load will hence be 1,080 PE.

3.1.1.4 Total Future Load

Based on the figure noted above the design load of the wastewater treatment plant is calculated as follows.

Table 4 – Existing and Future Loads

	Current PE	Increase in PE	Design PE
Domestic	1,632	648	2,280
Non-Domestic	580	500	1,080
Total	2,212	1,148	3,360

It is proposed to design the extended and upgraded wastewater treatment to cater for a population equivalent of 3,500 PE.

3.1.1.5 Nutrient loadings

The current load is estimated to be 2,214 PE. A discharge volume per person of 180/l/day is usually considered appropriate when determining effluent flows. This will result in a total flow of 398.52 m3 per day. The most recent BOD results for the treated effluent in May 2004 were 33 and 74 mg/l; giving an average of 53.5 mg/l. This would result in a total BOD discharge to the river of 21.32 kg/day. The level of suspended solids was recorded in May 2004 was 177mg/l. This will result in a total discharge of 70.54 kg/day to the Bandon River.

It is assumed that within the next 20 years a population equivalent of 3,500 will be reached in Dunmanway; an increase of 58.1%. In the absence of upgrade and increased treatment efficiency this would result in a total BOD discharge of 33.71 kg/day and a total suspended solid discharge of 111.53 kg/day.

Based on the above, the current discharge of sewage would be expected to cause deteriorations in water quality. In the absence of an appropriate upgrade the increased in population in Dunmanway will lead to greater discharge of nutrients to the Bandon River.

3.1.1.6 Existing discharge impact

Currently the treatment plant discharges via a concrete pipe into a channel of the Bandon River. The river in this area is braided and forms a number of channels, which meander, through dense woodland. There are numerous backwaters and dead-end channels and the exact flow pattern will vary continuously depending on the volume of water flowing in the river. Upstream of the discharge point a large proportion of the available water is diverted into another channel, which is not affected by the discharge. The treated effluent discharges into a shallow pool, which is drained by two channels.

The river was visited during moderate flow conditions and during low flow conditions. The effect of the discharge can be determined by the silt deposition pattern. Based on this pattern it was determined that the discharge is diverted through the larger of the two channels (denoted channel “A” for the purposes of this report). Deep silt has built up along the bank for approximately 4m between the discharge point and the mouth of channel A. In places this layer of silt is up to 0.5m in depth. This pattern of silt deposition continues down channel A which runs for 308m before rejoining the main channel. In the upper reaches of this channel there are obvious indications of the effect of the discharge with strong growth of sewage fungus on woody material in the stream. Sanitary products were also noted.

At moderate flows some of the water from this pond does discharge through a second smaller channel (denoted channel “B” for the purposes of this report). During low flows a spit of gravel is obvious which allows only minimal flow to channel B. The mouth of this channel is on the opposing bank of the pond from the discharge pipe. There is a short section of riffle with gravel giving way to deep slow-flowing pools with a soft substrate.

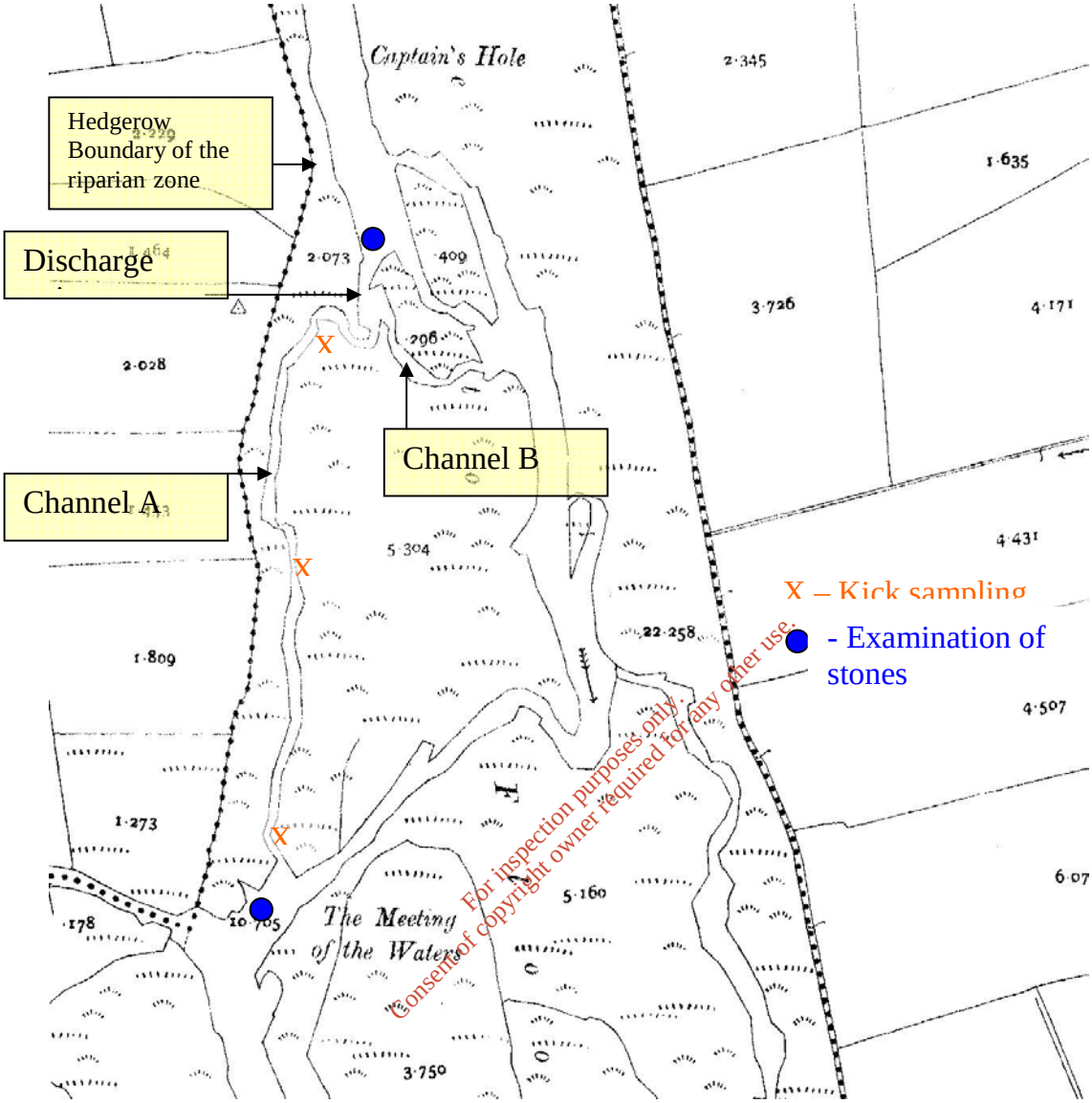
None of the distinctive grey silt found in channel A is present within this channel and likewise no sewage fungus or sanitary products were noted in this channel.

Based on the physical structure of the channel, the pattern of silt deposition and sewage fungus it seems improbable that any more than minimal amounts of treated effluent reach channel B at present.

The structure of the channel and silt plume at the discharge point is shown in Photography (I) & (II) and Map 4.

Photography (I) showing silt plume

Photography (II) showing structure of the channel at the discharge point.



Map 4: Structure of the channel at the discharge point

* The structure of the river is continually changing. This map is therefore given to provide an overview and may not coincide exactly with conditions on the ground.

3.1.2 PROPOSED SEWERAGE SCHEME

3.1.2.1 Treatment plant

Due to the increasing load on the plant and the need to provide a satisfactory effluent quality, it is proposed to upgrade the treatment plant to cater for the future increased loads. This plant will be designed to serve a population equivalent of 3,500 persons. The proposed treatment standards are shown in Table 5 and a comparison of treatment from the existing and upgraded treatment plants is shown in Table 6:

Table 5: Proposed treatment standards.

Parameter	Value	Unit
Design Capacity	3,500	p.e.
BOD	25	mg/l
COD	125	mg/l
Suspended Solids	35	mg/l
Total Phosphorus	1.5	mg/l

Table 6: A comparison of treatment efficiencies for SS and BOD

	Population equivalent 2214 180l/person/day BOD 53.5 mg/l SS 177 mg/l	**Upgraded treatment plant. Predicted 3,500 PE 180l/person/day BOD 25mg/l, SS 35 mg/l**	**% reduction in total discharge**
BOD kg/day	21.32	15.75	26.13
SS kg/day	70.54	22.05	68.74

As detailed above the upgrade will significantly reduce effluent loading and the amount of nutrients reaching the river despite the increase in population. It is also noted that the population size will increase incrementally; thus in the short term the amount of nutrients being discharged will be considerably lower.

3.1.3 Information about the Special Area of Conservation

3.1.3.1 Site Designation

The section of the Bandon River into which the treatment plant discharges is a Special Area of Conservation (SAC 2171). See Site Synopsis at Appendix 1.

The site is important for a number of reasons. It contains a small though very important example of the Annex I priority habitat Alluvial Forest as well as good examples of another Annex I habitat - Floating River Vegetation. The Annex II animal species Otter, Salmon (*Salmo salar*), Brook Lamprey (*Lampetra planeri*) and Freshwater Pearl Mussel (*Margaritifera margaritifera*) occur. The populations of the Mussel are thought to be nationally important. The Kingfisher, listed under Annex I of the E.U. Birds Directive, breeds along the river.

3.1.3.2 Habitats

A number of different habitat types are located at or close to the site of the proposed discharge pipe. Site visits were conducted April 23rd, May 25th, and June 10th 2004. The

initial visits were walkover surveys using Phase 1 methodology (JNCC 93) to identify habitat types. Species lists were compiled during subsequent site visits. All habitats were classified to level 3 of the classification scheme outlined in *A Guide to Habitats in Ireland* (Fossit, 2000) and a list of the species on which the habitat classifications are based is included in Appendix 2. It should be noted that some of the habitats are transitional and where this occurs they are placed in the category they most resemble.

3.1.3.3 Aquatic Habitats

Eroding River FW1/Depositing River FW2

The site synopsis notes that this section of the Bandon River *"contains a small though very important example of the Annex I priority habitat Alluvial Forest as well as good examples of another Annex I habitat - Floating River Vegetation"*

Floating vegetation of the type mentioned in the site synopsis occurs immediately upstream of the discharge point on the smaller channel and approximately 300m downstream in the main channel. This type of vegetation is generally absent from the smaller channel. Primarily this is due to heavy shading by riparian vegetation within the woodland area and it is noticeable that where the canopy opens up the growth of aquatic flora increases.

Immediately upstream of the discharge there are examples of the type of vegetation referred to by the site synopsis. Water crowfoot is common and also noted were starwort, water milfoil and the moss *Fontinalis* sp. A dense stand of bogbean also occurs upstream of the discharge point on the same bank. Sections of the riverbank and wetter areas close to the river also contain aquatic or semi aquatic species including hemlock water dropwort, valerian, mint and marsh marigold (*Caltha palustris*).

Several aquatic plant species which are considered important or uncommon are noted in the site synopsis namely; Shoreweed (*Littorella uniflora*) and Six-stamened Waterwort (*Elatine hexandra*), a moss species *Brachythecium rivulare,* a liverwort *Chiloscyphus polyanthos* var. *polyanthos,* an algae species *Nostoc, a* liverwort *Riccardia chamaedryfolia* and a moss *Fissidens crassipes.* None of these species were noted in channel A and given the absence of a diverse aquatic flora and the heavy shade/siltation the presence of any of these species in channel A is considered very unlikely.

3.1.3.4 Macroinvertebrate Analysis

Due to the risks associated with disturbing juvenile mussels no kick sampling was carried out in the main channel where the survey was confined to examining larger stones. Due to absence of larger stones and following the determination by survey that freshwater mussels were absent kick-sampling was conducted at three sites on the side channel.

The distribution of macroinvertebrates shows a distinct pattern. Upstream of the discharge point heptageniid mayflies, which are highly sensitive to pollution, are common. Gravels in this area are clean with low silt levels and diversity appears good with species such as *Rhyacophila* sp., *Emphemerella* sp., and *Baetis* sp. also noted.

A kick sample taken 10m downstream of the discharge point indicates a sharp decline in water quality. The streambed at this location is heavily silted with dense growth of sewage fungus. Tubificid worms, which are highly tolerant of pollution, were the dominant taxa and *Chrionomous* sp., which are similarly tolerant, were also noted. Minimal numbers of the uncased caddis *Hydropsyche* sp. and the freshwater shrimp *Gammerus* sp. were also noted. A Q value of 1-2 was assigned.

A second kick sample was taken approximately 150m downstream of the discharge point. Although some recovery of the biota was evident, reappearance of *Baetis* sp. in small numbers and increased numbers *Gammerus* sp. However tolerant species are still common and the most pollution species such as hegtageniid mayflies are still completely absent. Although this sample was taken from a riffle area with lower shade than the previous site (60% approximately) high silt levels were again evident. A Q value of 2-3 was assigned.

A third kick sample was taken immediately upstream of the confluence of channel A and the main channel. Water movement was slow at this location with a soft substrate and high silt levels. The diversity and density of species at this location was broadly similar to those detected at the previous site. No hegtageniid mayflies were detected. A Q value of 2-3 was assigned.

Finally an examination of stones was made in the main channel downstream of its confluence with channel A. Kick sampling was not carried out to prevent incidental damage to mussels. Heptageniid mayflies were noted in high numbers on the underside of larger rocks and diversity generally was found to be higher. Silt levels were low. Dense growths of aquatic macrophytes (water crowfoot) were evident in the main channel at this location.

Based on the pattern of invertebrate distribution it would appear that the current discharge is severely impacting on water quality in channel A. This effect is particularly evident close to the discharge point. However notwithstanding the excessive shading and slow-flows which would naturally depress the diversity and density of macroinvertebrates it would appear that this effect continues for the length of the channel. However the additional flow available in the main channel downstream of the confluence would appear to provide sufficient dilution and no impact on water quality was detected.

3.1.3.5 Terrestrial habitats

The field in which the treatment plant is located contains similar semi-intensive grassland best categorised as *Dry calcareous and neutral grassland GS1*. Grass species include sweet vernal grass, Yorkshire fog, ryegrass (*Lolium perenne*), timothy (*Phleum pratense*) and meadow foxtail (*Alopecurus pratensis*). Herbaceous species include creeping

buttercup (*Rananculus repens*), plaintain (*Plantago lanceolata*), clover (*Trifolium* sp.) and nettle (*Urtica diocia*). This habitat is not of particular conservation value.

At the discharge point the terrestrial habitats consist of a mixture of habitats including *Riparian woodland WN5*, *Hedgerows WL1*, *Scrub WS1* and *Dry meadows and grassy verges GS2*. The grassland area consists of a mixture of common grass species and herbaceous species. Growth is luxuriant reflecting limited grazing and periodic influxes of nutrients via flooding of the river. The grass species noted include cocks foot (*Dactylis glomerata*), sweet vernal grass (*Anthoxanthum odoratum*), Yorkshire fog (*Holcus lanatus*), and meadow grass (*Poa* sp). Taller vegetation includes dock (*Rumex* sp.), hogweed (*Heracleum sphondylium*), nettle (*Urtica diocia*) and angelica (*Angelica archangelica*), sorrel (*Rumex acetosa*), mayflower (*Cardamine pratensis*).

The site synopsis refers to "*contains a small, though very important example of the Annex I priority habitat Alluvial Forest"*. The bulk of this type of habitat is located to the south of the discharge point. At the discharge point the riverbank and adjacent field has a mixture of hazel (*Corylus avellana*), willow (*Salix* sp.) alder (*Alnus glutinosa*) and blackthorn (*Prunus spinosa*). The bankside trees are important in maintaining the stability of the riverbanks and some of the older willow and hazel support dense growths lichens. Also noted was guelder rose (*Viburnum opulus*), ransoms (*Allium ursinum*), bluebell (*Endymion non-scripus*), wood avens (*Geum urbanum*), figwort (*Scrophularia nodosa*) and golden saxifrage (*Chrsoplenium oppositifolium*).

A hedgerow separates the riparian area and the field in which the treatment plant is located. The hedge is contiguous with areas of scrub and contains native willow (*Salix* sp.), hawthorn (*Cratagus minogyna*), willow (*Salix* sp.), holly (*Ulex europeaus*) and oak (*Quercus* sp.) and blackthorn.

None of the species noted are protected under the Wildlife Act (1976) and the Flora (Protection) Order, 1999. Although none of the species noted are rare the habitats in the vicinity of the discharge point are part of a much larger mosaic of watercourses, riparian woodland and scrub. This total area is of high conservation value and disturbance to riparian habitats should be minimised.

3.1.3.6 Fauna

The following Annex II animal species Otter (*Lutra lutra*), Salmon (*Salmo salar*), Brook Lamprey (*Lampetra planeri*) and Freshwater Pearl Mussel (*Margaritifera margaritifera*) occur within the site.

Freshwater mussel

The pearl mussel is one of three species of large Unionacean bivalves found in Irish freshwaters. The species may occur in fast-flowing, oligotrophic, calcium deficient streams and rivers. The species is on the IUCN Invertebrate Red Data List and is protected under the Convention on the Conservation of European Wildlife and Natural

Habitats (Bern Convention). *Margaritifera* is also listed in Annex II and Annex V of the Habitats Directive (92/43/EEC) and is protected by law in Ireland under the 1976 Wildlife Act (Statutory Instrument No. 112, 1990). As noted in the site synopsis the populations of freshwater mussel at this location are thought to be of national importance.

Given the conservation value of this species, it was considered necessary to conduct a survey to determine if this species was present within channel A. This survey was conducted by Dr. Eugene Ross and the results and conclusions drawn from this survey are given in Appendix 4. The survey did not detect freshwater mussel within channel A.

Otters

Otters are found throughout the Bandon catchment and also occur within this general area.

The following are considered to be indicators of otter activity:

1-Spraints and anal glands

2-Footprints and sign heaps

3-Runs or paths

4- Feeding sites and prey item remains

The treatment plant is situated a considerable distance back from the river and works here are unlikely to have any significant impact on otters. The most likely source of disturbance to otters could arise to due bankside works at the discharge point. No signs of otter activity were noted at the discharge point or in its immediate vicinity. Any works in this area will be of limited duration. The area is generally overgrown with large amounts of cover available and no significant disturbance of otters is considered likely.

Other Mammals

Field mouse, brown rat and bank vole are extremely common in the Irish countryside and although no specialised survey was considered necessary there are almost certainly present with the vicinity of the discharge point. Rabbits are common in the general area and other species likely to be present include pigmy shrew, Irish hare and hedgehog. Evidence of both fox and badger was noted downstream of the discharge point but no evidence of either dens or setts were noted in the immediate vicinity of the discharge point. Bats are generally common in the types of habitat encountered and two bat species (Daubenton's Bat and Pipistrelle) are mentioned in the site synopsis. However the trees likely to be affected by the construction works are either of limited size and/or age and the likelihood of significant bat roosts being disturbed is considered very remote.

Brook Lamprey

The brook lamprey (*Lampetra planeri*) is non-migratory. It is found in sandy and gravely river and streams and breeds where the gradient of the river is shallow. (Whilde,1993).

No specialised survey was carried out for this species however a lamprey was noted immediately downstream of the confluence of channel A and the main channel. Although it was not captured or conclusively identified it seems likely that this individual was a brook lamprey.

Given the high silt levels and poor water quality in channel A it is unlikely that brook lamprey will occur within this channel. Overall this side channel in its current condition is considered to be of minimal value for this species.

Salmonid Species

Salmon, sea-trout and brown trout all occur within the Bandon catchment. Channel A does not provide suitable breeding habitat for any salmonid species due to slow flows, absence of suitable gravels and heavy siltation. Based on analysis of macroinvertebrates water quality in channel A is poor and would not support salmonids. Salmonid species may occur downstream however albeit in very small numbers. No suitable holding pools for adult salmon were noted. Overall this side channel in its current condition is considered to be of minimal value for salmonid species.

Other fish species

Other fish species found in the Bandon river include eel, stickleback and minnow. All three species are likely to be common in the main channel. These species may occur in limited densities in certain sections of channel A, however this channel is not expected to be of particular significance for these species.

Birds

Rivers support a number of specialised bird species including dipper, kingfisher, heron, mallard, moorhen and swans. These species are all likely to occur within the overall catchment of the Bandon River although only heron, mallard and moorhen were noted in immediate proximity to the discharge point. A moorhen was nesting very close to the discharge point at the time of the survey. A number of other bird species will occur within the undisturbed woodland habitat, which exists on the banks of the river. These species are generally common in a mixed agricultural landscape and species noted included wren, robin, long-tailed tit, song thrush and pigeon Given that any impact will be of limited duration and a large area of similar habitat is located adjacent to the site no significant impacts on birds is considered likely.

3.1.4 Key Information Sources

Appendix 1 : Site Synopsis

Appendix 2 : Species List

Appendix 3 : Pearl Mussel Draft Bandon Sub-Plan March 2009

Appendix 4 : Freshwater Pearl Mussel Survey by Dr. Eugene Ross

3.2 Step Two : Impact Prediction

3.2.1.1 Impacts on Fish

The Bandon supports important populations of salmonid fish and brook lamprey. These species are susceptible to deteriorations in water quality. Salmonid species breed in clean gravels and therefore breeding success can be affected by increased silt levels.

3.2.1.2 Impacts on invertebrates.

From conservation viewpoint the freshwater pearl mussel is the most important invertebrate species in the Bandon River. This species is susceptible to deteriorations in water quality and is particularly sensitive to large increases in suspended solids. Given the conservation value of this species, it was considered necessary to conduct a survey to determine if this species was present within channel A into which the proposed outfall will discharge. This survey was conducted by Dr. Eugene Ross and the results and conclusions drawn from this survey are given in Appendix 4. The survey did not detect freshwater mussel within channel A.

The distribution of other macroinvertebrate species within the watercourse will be altered by changes in water quality however these impacts will be localised in extent.

3.2.1.3 Impacts on aquatic vegetation

Changes in nutrient levels will affect the distribution and density of aquatic plants. High levels may increase growth however the diversity of species may be significantly reduced. In these circumstances water crowfoot may be dominant and where nutrients levels are extremely elevated algae and other fungal growths may be dominant.

3.2.1.4 Noise Impact

Noise impacts could occur during construction and from the everyday operation of the plant. The treatment plant itself is situated in an agricultural landscape where noises associated with farming are common and in this context works at the plant itself are unlikely to significantly impact on noise levels. The outfall laying works will be relatively short in duration and will take approximately 4 weeks to complete. Some impact on mammals and birds would be expected to occur due to noise generated by work on the pipeline. This impact will increase as the works get closer to the river. However given the limited duration of the works and the degree of cover available close to the discharge point this impact is expected to be of local significance only and no long-term impacts are expected. Following construction of the wastewater treatment plant it is recommended that noise levels do not exceed 55db during daylight hours and 45db at night. Under these circumstances no significant impacts are considered likely.

3.2.2 Disposal Options

The following disposal options could conceivably be used:

1- Discharge on side channel A downstream of the current discharge point

2- Existing discharge point

3- Discharge to the main channel upstream or downstream of the current discharge point

3.2.2.1 Discharge to channel A downstream of the current discharge point

Based on the structure of the watercourse, the pattern of silt deposition and the distribution of invertebrates and macrophytes/algae it was determined that the discharge is already affecting channel A which obviously provides much lower dilution than the main channel. No impact was noted in the main channel. It is noted that although water quality in this smaller channel has obviously deteriorated this has helped to maintain suitable conditions for freshwater mussels elsewhere in the river. In particular this channel gives additional protection in the event of a catastrophic event such as complete failure of the treatment plant. Given the vulnerability and comparative rarity of freshwater mussel their protection is considered to be the highest priority. In these circumstances the negative effects on channel A are considered less important than the potential impacts on mussel habitat in the main channel.

An examination of channel A indicates that high levels of silt have been deposited within this channel and thus was prevented from reaching the main channel where conditions are more suitable for mussels. Given the length of the channel (310m) and low velocity flows during dry periods it is estimated that only a small proportion of the suspended solids derived from the treatment plant may actually reach the main channel under these conditions. It is difficult to estimate how much of this deposited silt is remobilised during spate events. This is because of the braided and complex channel which makes it difficult to predict how much water will move down channel A in high flow conditions. A basic visual estimate of flows and depths at low water conditions suggests that approximately 10% of the total flow in the Bandon River moves through Channel A. However it is noted that if some of this silt is remobilised during spate events there will be a high level of dilution available which will minimise any impact.

It is noted that the reduction in nutrients reaching channel A will help to improve water quality and the diversity of macroinvertebrates may improve although heavy shading will naturally limit macrophyte development. However, even if all discharges into this channel were stopped it is uncertain that this channel would support significant mussel populations. In the short term the high levels of silt will preclude colonisation by this species and given the depth of this silt in some areas and the relatively low flows it is considered unlikely that this silt will clear within a short time frame.

In circumstances where a new pipe is required it would be preferable to move the discharge point downstream so that it discharges completely into channel A. The

terrestrial and riparian habitats to be affected would not be significantly different to those existing at the discharge point and the exact route could be designed to avoid the more locally important habitats such as individual or groups of trees. Channel A flows in a south-westerly direction and by choosing a suitable location the distance from the external hedgerow to the channel can be minimised.

However the development of a new pipeline could lead to the deposition of high levels of silt and other substances if strict mitigation measures are not put in place.

3.2.2.2 Existing discharge point

The advantage of using the existing pipe and discharge point is that disturbance of the river and riparian habitats can be avoided. This would allow existing riparian habitats to be maintained. Also, under these circumstances, the deposition of additional high levels of silt from the construction process could be avoided. An examination of the pipe indicates that it may be possible to reuse it. If the pipe in its entirety cannot be used even the use of the last section of pipe could prevent damage to the river and the generation of silt. This is particularly important in respect of freshwater mussel populations.

However it is predicted that the flow from the treatment plant will increase by approximately 37% in line with the increase of population to 3,500 p.e. As noted earlier at low flows, a spit of gravel diverts most of the effluent flow into channel A. However the higher predicted flows from the upgraded treatment plant and/or changes in the structure of what is an essentially unstable channel structure could result in the removal of this spit of gravel. This could conceivably cause some of the effluent to reach channel B and thereby constitute a risk to mussels known to exist downstream of this point.

3.2.2.3 Discharge to the main channel upstream or downstream of the current discharge point

Discharge to the main channel of the Bandon River would result in greater dilution being available at the discharge point and based on mass balance equations and waste assimilative capacity calculations the increases in phosphorous and BOD levels would not cause serious deteriorations in water quality.

However the movement of the discharge point onto the main channel would expose habitats, which previously were pristine or marginally affected to increased levels of nutrients and suspended solids. A breakdown in treatment or the introduction of dangerous chemicals could have a serious impact on the main channel. There would also be high risks associated with the construction of a new discharge point, which could lead to siltation. In addition to possible impacts on freshwater mussels high levels of suspended solids could also impact on salmonid spawning gravels and increased nutrients could affect the diversity of aquatic plants.

3.2.2.4 Preferred disposal option

Based on the information outlined above it is recommended that, provided certain mitigation measures are put in place, the preferred option is the provision of a new discharge pipe discharging to channel A downstream of the existing discharge point. The exact route of the pipe should be designed to as to provide minimum disturbance to riparian habitats and to prevent any instability in the riverbank. The use of the existing discharge point is considered a secondary option and the use of a new discharge on the Bandon River should be considered as a last resort.

3.3 Step Three : Conservation objectives

An examination of the existing discharge indicates that most of the effluent is being discharged into a side channel (Channel A). The distribution of silt, sewage fungus and algae indicates that water quality has seriously deteriorated in this side channel.

Notwithstanding the predicted increase in population over the next twenty years the improvement in treatment standards will result in significantly reduced discharge of effluent load and nutrients to the Bandon River.

A survey determined that freshwater mussel is not present in channel A and given the levels of silt and algae the presence of other sensitive species such as brook lamprey and salmon is considered very unlikely. Given that freshwater mussel are present in other channels in this section of the Bandon River a discharge to channel A would create the least risk to this species.

A survey of terrestrial habitats did not detect any rare species however the riparian habitats noted are part of a larger woodland habitat and disturbance should therefore be minimised.

3.3.1 Describe how the project or plan will affect key species and key habitats. Acknowledge uncertainties and any gaps in information.

The improved effluent quality which will ensue from this project will have a beneficial effect on the river water quality and particularly on channel A into which the relocated outfall will discharge.

As indicated earlier the Freshwater Pearl Mussel is not resident in channel A and will not be affected.

A survey of terrestrial habitats did not detect any rare species however the riparian habitats noted are part of a larger woodland habitat and disturbance should therefore be minimised.

The exact route of the proposed relocation of the discharge pipe could be designed to avoid the more locally important habitats such as individual or groups of trees. By choosing a suitable location the distance from the external hedgerow to the channel can be minimised.

3.4 Step 4 : Mitigation Measures

1. It is important that damage to the riparian zone is minimised and it is recommended therefore that large machinery is excluded from this area. Hand tools should be used in close proximity (within 10m) of the river. As a general guideline the hedge at the eastern end of the field in which the treatment plant is located should form a boundary beyond which heavy machinery should be excluded.
2. The new pipeline should be located as close as practically possible to the beginning of channel A. This maximises the length of channel A available downstream of the discharge point. However the new discharge point must be located so as to minimise the risk of erosion of the riverbank. In particular the number of mature trees to be removed should be minimised and positioning of the pipe should give due regard to specific trees which are stabilising the riverbank.
3. Due to the risks of pollution associated with instream works, a precast concrete structure is preferable where stabilisation of the discharge point is required.
4. It is important that the land-take area is restricted to the minimum necessary to provide the new discharge pipe. Storage of materials and vehicles should only take place outside of the riparian zone.
5. Consultation with an ecologist is recommended both in the design of a suitable route and during the construction phase. This route should be carefully marked out and agreed with Duchas prior to commencement of works.

3.5 Outcomes

Following the implementation of mitigation measures described in this Appropriate Assessment it is expected that the construction and operation of the proposed Dunmanway Waste Water Treatment Plant will avoid negative impacts to the key SAC objectives. Positive impacts are likely to water quality in the river following this upgrade.

It is concluded therefore that there is no requirement for Stage 3 (Assessment of Alternative Solutions) and 4 (Assessment Where Adverse Impacts Remain) of the Appropriate Assessment.

Appendix 1

APPENDIX 1: SITE SYNOPSIS

SITE NAME: BANDON RIVER
SITE CODE: 002171

The site consists of relatively short adjoining stretches of the Bandon and Caha Rivers. These rivers flow in a southerly direction to the east of Dunmanway, Co. Cork. Towards the southern end of the site the Bandon takes an easterly course. The predominant rock formations are Old Red Sandstone to the north and Carboniferous Slate stretching south of Dunmanway. Soils in the northern section consist of peats, podzols and skeletal soils. The southern section consists of alluvial soils and Brown Podzolics.

The east-west exposure of Old Red Sandstone to the north of Dunmanway displays distinct ridgelines of bare rock with poor pasture and scrub. In this area around Lovers Leap the Bandon River cuts a narrow channel southwards, cascading over a series of rock steps through a narrow valley. Below this and above Long Bridge the river widens and meanders through a fertile floodplain. Immediately south of the Long Bridge the reduced flow gradient and broad, flat valley permit the main channel to split and extend into a network of braided streams forming islands.

The site is important for a number of reasons. It contains a small though very important example of the Annex I priority habitat Alluvial Forest as well as good examples of another Annex I habitat - Floating River Vegetation. The Annex II animal species Otter, Salmon (*Salmo salar*), Brook Lamprey (*Lampetra planeri*) and Freshwater Pearl Mussel (*Margaritifera margaritifera*) occur. The populations of the Mussel are thought to be nationally important. The Kingfisher, listed under Annex I of the E.U. Birds Directive, breeds along the river.

Wet broadleaved semi-natural woodland is found in an undisturbed area of braided river channels and islands below Dunmanway. The river channels are well defined and the islands appear solid. Canopy dominants are Hazel (*Corylus avellana*) (multi-stemmed) and Sessile Oak (*Quercus petraea*), with scattered Downy Birch (*Betula pubescens*), Ash (*Fraxinus excelsior*), Rusty Willow (*Salix cinerea* subsp. *oleifolia*) and Alder (*Alnus glutinosa*). There is a very sparse understorey composed of Whitethorn (*Crataegus monogyna*), Holly (*Ilex aquifolium*) and saplings of Hazel and Sessile Oak. Epiphytes are abundant on trees: Ivy (*Hedera helix*), Honeysuckle (*Lonicera periclymenum*) and bryophyte species such as *Isothecium myosuroides*. The ground flora is dominated by Ramsons (*Allium ursinum*), Wood Anemone (*Anemone nemorosa*), Ivy with abundant/scattered Lesser Celandine (*Ranunculus ficaria*), Wood Sedge (*Carex remota*) and Irish Spurge (*Euphorbia hyberna*). Goldilocks Buttercup (*Ranunculus auricomus*), a very rare plant in Co. Cork, has been recently recorded from this woodland.

Floating river vegetation is found along the length of the river and is dominated by Water-crowfoot (*Ranunculus* spp). Other aquatic plants found include Alternate Water-milfoil (*Myriophyllum alterniflorum*), Broad-leaved Pondweed (*Potamogeton natans*) and four Water-starwort species (*Callitriche* spp.). Mosses present on rocks and attached to tree roots include *Fontinalis antipyretica* in slack flow areas and *Fontinalis squamosa, Rhynchostegium riparioides* and *Amblystegium riparium* in moderate flows.

The landward fringe of deep pools supports Yellow Water-lily (*Nuphar lutea*), Bogbean (*Menyanthes trifoliata*), Marsh Marigold (*Caltha palustris*), Water Mint (*Mentha aquatica*) and Fool's Water-cress (*Apium nodiflorum*). Shoreweed (*Littorella uniflora*) and Six-stamened Waterwort (*Elatine hexandra*) are two species of local importance which are found in the river. In moderate current flow below the Long Bridge, the larger stones are covered by the moss *Brachythecium rivulare* and the Liverwort *Chiloscyphus polyanthos* var. *polyanthos.* Boulders covered in *Nostoc* algae are probably of local occurrence in Ireland. The liverwort *Riccardia chamaedryfolia* and the moss *Fissidens crassipes* found under the Long Bridge are considered to be rare in Ireland.

Heath in mosaic with wet grassland, exposed rock, scrub and improved grassland covers up to 30% of the site north of Long Bridge. Typical heath plants growing in association with the rocks are abundant Western Gorse (*Ulex gallii*), Ling Heather (*Calluna vulgaris*), Bell Heather (*Erica cinerea*), Cross-leaved Heath (*E. tetralix*), Tormentil (*Potentilla erecta*), Heath Grass (*Danthonia decumbens*), Stonecrops (*Sedum* spp.), small amounts of St Patrick's Cabbage (*Saxifraga spathularis*) and many lichen species.

Some small areas of woodland occur within the site north of Long Bridge. Tree species such as Sessile Oak, Beech (*Fagus sylvatica*), Scots Pine (*Pinus sylvestris*) and Downy Birch are found with an understorey of Holly, Hazel, Rowan and Rusty Willow.

Two Red Data Book plant species have been recorded in the past from within or close to the site - Greater Broomrape (*Orobanche rapum-genistae*), a species that grows on the roots of legumes, and Small White Orchid (*Pseudorchis albida*), a species of upland pastures and heaths that is protected under the Flora Protection Order 1999.

The river below Long Bridge is an important inland site in Cork for Mute Swan and approximately 20 individuals are present throughout the year along this stretch. Several hundred Snipe use the site during the winter. Other birds seen regularly within the site are Grey Heron, Cormorant and Mallard, while low numbers of Lapwing and Teal visit during the winter.

The site supports many of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Badger, Irish Hare, Daubenton's Bat and Pipistrelle. The two bat species can be seen feeding along the river and roosting under the old bridges.

Landuse at the site consists mainly of sheep grazing in the northern section and cattle grazing on improved grasslands below Lovers Leap and further south. In the area between Milleenanannig and Bealaboy Bridge land reclamation and drainage is taking place. In the area of exposed rock on the higher terrain above Ardcahan Bridge some land reclamation and forestry is carried out.

This site contains good examples of two habitats listed on Annex I of the E.U. Habitats Directive - alluvial forest and floating river vegetation - and supports populations of four Annex II species - Otter, Salmon, Brook Lamprey and Freshwater Pearl Mussel. The presence of a number of Red Data Book plant and animal species adds further interest to the site.

Appendix 2

APPENDIX 2: SPECIES LIST PLANTS

Alnus glutinosa	Alder
Agrostis spp.	Bent grass
Ajuga repans	Bugle
Alisma plantago-aquatica	Water plaintain
Alopecurus geniculatus	Marsh Foxtail
Alopecurus pratensis	Meadow foxtail
Angelica archangelica	Angelica
Anthoxanthum odoratum	Sweet vernal grass
Anthriscus sylvestris	Cow parsley
Apium nodiflorum	Fools watercress
Asplenium scolopedrium	Hartstongue Fern
Athyrium filix-femina	Ladies Fern
Bellis perennis	Ribwort Plantain
Betula pubescens	Downy Birch
Blechnum spicant	Hard Fern
Callitriche sp.	Starwort
Calstegia sepium	Hedge Bindweed
Caltha palustris	Marsh Marigold
Capsella bursa-pastoris	Shepards Purse
Cardamine pratensis	Mayflower
Carex flacca	Carnation Sedge
Carex remota	Remote sedge
Carex rostrata	Bottle Sedge
Carex spp.	Sedge
Centuarea nigra	Lesser Knapweed
Chrysplenium oppositifolium	Golden Saxifrage
Cirsium arvenesis	Creeping thistle
Cirsium palustre	Marsh Thistle
Cirsium spp.	Thistle
Conopodium majus	Pignut
Corylus avellana	Hazel
Crataegus monogyna	Hawthorn
Cynosuros cristatus	Crested dogs tail
Dactylis glmerata	Cocksfoot
Digitalis purpurea	Foxglove
Dryopteris afffinis	Scaly Male Fern
Dryopteris filix-mas	Male Fern
Eleocharis palustris	Common spike rush
Endymion non-scriptus	Bluebell
Eymus repens	Couch Grass
Filiendula ulmaria	Meadow sweet
Fontinalis sp.	Moss
Fraxinus excelsior	Ash

Galium aparine	Goose grass
Geraium robertianum	Herb Robert
Geran ium dissectum	Cut leaved cranesbill
Geum urbanum	Wood avens
Helix hedera	Ivy
Heracleum sphondylium	Hogweed
Ilex aquifolium	Holly
Iris psuedocorus	Yellow Flag
Juncus spp.	Rush
Lecanthemum vulgare	Oxeye Daisy
Lepidiumheterophyllum	Smiths cress
Ligustrum vulgare	Privet
Lolium perenne	Rye grass
Lonicera periclymenuem	Honeysuckle
Lysimachia nemorum	Yellow pimpernel
Mentha aquatica	Water mint
Menyanthes trifoliata	Bog bean
Myosotis arvensis	Forget-me-knot
Nasturtium officinale	Watercress
Nyphaea alba	Water lily
Plantage lanceolata	Ribwort Plantain
Plantago major	Greater plantain
Poa sp.	Meadow grass
Potamogeton spp.	Pondweed
Potentilla anserina	Silver weed
Primula vulgaris	Primrose
Prunella vulgaris	Self heal
Prunus spinosa	Blackthorn
Pteridium aquilium	Bracken
Quercus sp.	Oak
Ranunculus flammula	Lesser spearwort
Ranuculus acris	Meadow Buttercup
Ranunculus sp.	Water crowfoot
Ranunculus repens.	Creeping Buttercup
Rosa sp.	Dog rose
Rubus fruitocosus	Bramble
Rumex acetosa	Common sorrel
Rumex spp.	Dock
Salix spp.	Willow
Senecia jacobaea	Ragweed
Senecia vulgaris	Groundsel
Sonchus spp.	Sowthistle
Taraxacum officinale	Dandelion
Trifolium repens	White clover
Urtica dioica	Nettle
Valeriana officinalis	Common valerian
Veronica sp.	Speedwell